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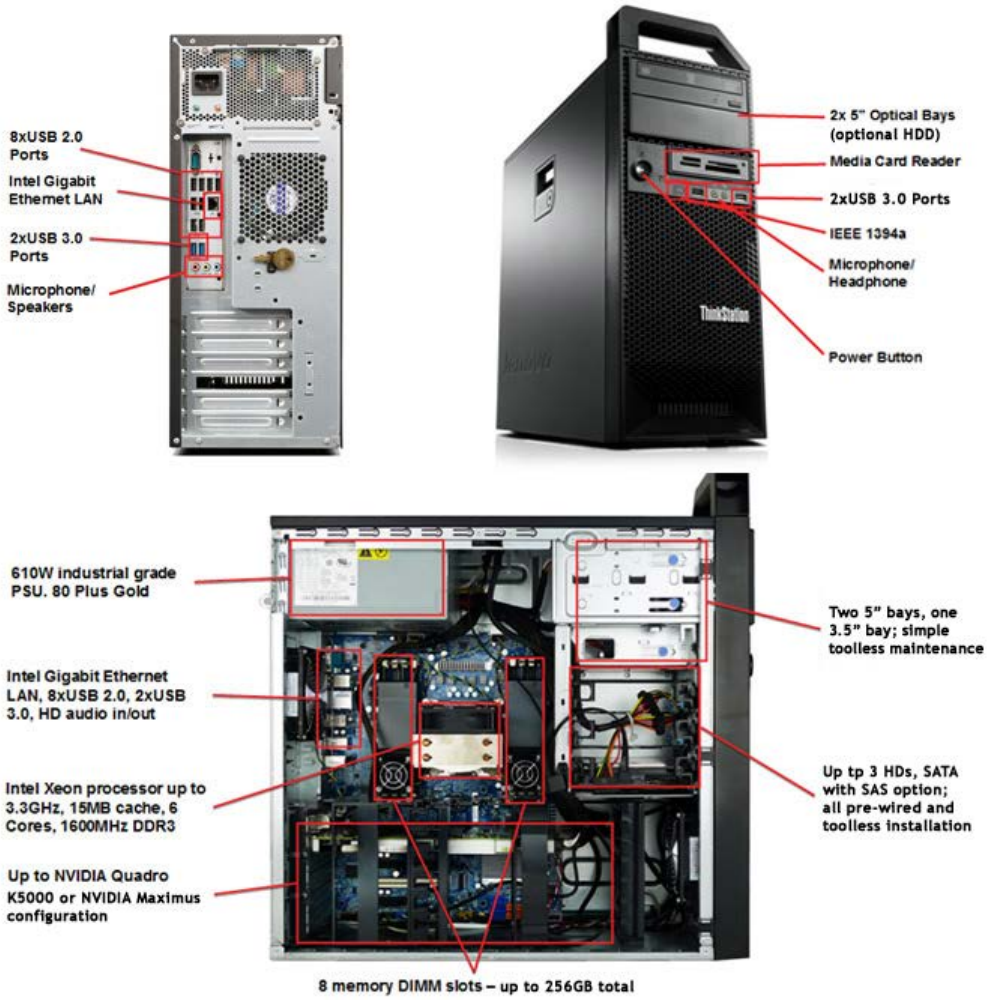
THINKSTATION S30


8xUSB 2.0 Ports
Intel Gigabit Ethernet LAN
2xUSB 3.0 Ports
Microphone/ Speakers
2x 5" Optical Bays (optional HDD)
Media Card Reader
2xUSB 3.0 Ports
IEEE 1394a
Microphone/ Headphone
Power Button
610W industrial grade PSU. 80 Plus Gold
Intel Gigabit Ethernet LAN, 8xUSB 2.0, 2xUSB 3.0, HD audio in/out
Intel Xeon processor up to 3.3GHz, 15MB cache, 6 Cores, 1600MHz DDR3
Up to NVIDIA Quadro K5000 or NVIDIA Maximus configuration
Two 5" bays, one 3.5" bay; simple toolless maintenance
Up tp 3 HDs, SATA with SAS option; all pre-wired and toolless installation
8 memory DIMM slots – up to 256GB total

Product Overview

The single-processor S30 workstation uses a full Advanced Technology Extended (ATX) motherboard, a 610 watt (W) power supply unit (PSU), and a 31-liter ATX form factor tower. The motherboard chipset consists of the Intel® Patsburg PCH supporting error-correcting code (ECC) unbuffered Double Data Rate 3 (DDR3) Synchronous Dynamic Random Access Memory (SDRAM). Maximum memory supported is 64GB for UDIMMs and 256GB (pending 32GB RDIMM availability). The processor socket is an Intel® 2011-pin Land Grid Array (LGA2011) Socket-R with support for dual core, quad core, six core, eight core, ten core and twelve core processors from the Intel® Xeon line.

SECTION I: SYSTEM OVERVIEW

Operating Systems

Preloaded
Genuine Windows 8® Professional 64-bit
Genuine Windows 7® Professional 64-bit
Genuine Windows 7® Professional 32-bit

Supported
Genuine Windows XP Professional 64-bit
Genuine Windows XP Professional 32-bit
Red Hat Enterprise Linux 6.2

Motherboard – S30

Table 1. S30 Motherboard Summary

S30 Motherboard Summary	
Form Factor	
Board Size	12.3" x 9.9" (311.66mm x 251.84mm)
Layout	Custom ATX
Motherboard Core	
Processor Support	Intel® Xeon™ Quad Core (Sandy Bridge EP) Intel® Xeon™ Six Core Intel® Xeon™ Eight Core Intel® Xeon™ Dual Core Intel® Xeon™ Ten Core Intel® Xeon™ Twelve Core
Socket Type	(1) x Intel Socket-R (LGA2011)
Memory Support	1600/1333/1066/800 MHz
QPI (GTPS)	6.4/7.2/8.0 GTPS Links
Voltage Regulator	VR 12.1 – 130W TDP
Chipset (PCH)	Patsburg –A (Intel C602) Support for SAS HDD enablement module HW module to allow enablement of –B SKU
Flash	128Mbit SPI Flash with FWH
HW Monitor	N/A
Super I/O	Nuvoton 6681D
Clock	ICS932SQ420B
Audio	Realtek ALC662-VD
Ethernet	Intel Lewisville – 82579
SAS	Integrated with Patsburg –A + SAS HDD enablement module
Memory	
Slots	8
Channels	4
Type	DDR3 Unbuffered SDRAM (UDIMM, RDIMM)
ECC Support	Yes
Speed	Up to PC3-12800 (1600MHz)
Max DIMM Size	up to 8GB UDIMM, up to 32GB RDIMM
Max System Memory	Up to 64GB UDIMM (w/8GB), Up to 256GB RDIMM (w/32GB)
Ethernet	
Vendor	Intel
Count	1
EEPROM	None (part of SPI flash)
Speeds	10/100/1000 Mbps
Functions	PXE WOL AMT Jumbo Frames
Connectors	(1) x RJ45 on Rear I/O
Audio	
Vendor	Realtek
Type	HD (5.1)

Internal Speaker	Yes
Connectors	(3) x Rear 3.5mm Jacks (Line In, Line Out, Microphone In) (2) x Front 3.5mm Jacks (Headphone out, Microphone In) (1) x 2-Pin Internal Speaker Header
Video	
Onboard	<Not Supported>
Adapter	(2) x PCI-E 3.0 16-Lane Slots Additional adapters may be supported in x4 slots for Spec Bids.
Multi-GPU Support	BIOS supported, card dependant
Storage	
Floppy	None
IDE	None
SATA/SAS	(2) x SATA Connectors, Gen. 2 (AHCI)(2) x SATA Connectors, Gen. 3 (AHCI) (3) x SATA/SAS Connectors, Gen. 2 (SCU) * SAS drives on SCU require SAS HDD enablement module to function (1) x eSATA Connector, Gen. 2 (eSATA bracket) • SATA RAID 0,1,5 supported natively via Intel Controller • SAS RAID 0,1 and SATA RAID 0,1 supported via SAS Enablement Module • SAS and SATA RAID 0,1,5 supported via LSI 9260-8i adapter • SAS and SATA RAID 0,1 supported via LSI 9240-8i adapter • SAS and SATA RAID 0,1,5 supported via LSI 9240-8i with key
eSATA	(1) x eSATA Connector, Gen. 2, cabled to slot via bracket
Slots	
Slot 1 (Near CPU)	16-Lane PCI-E v3.0 - Full Length, Full Height
Slot 2	4-Lane PCI-E v3.0 (16-Lane Mechanical) - Full Length, Full Height
Slot 3	16-Lane PCI-E v3.0 - Full Length, Full Height
Slot 4	PCI v2.3 - Full Length, Full Height
Slot 5 (Near Edge)	4-Lane PCI-E v2.0 Half Length, Full Height, open tailgate (RF 2.5)
Rear I/O	
COM	(1) x Serial Port (COM1)
eSATA	(1) x eSATA Port (Gen. 2), optional via bracket
LPT	None
Video	<No Onboard Video>
Audio	Microphone-In, Line In, Line Out
Ethernet	(1) x RJ45
USB 2.0	(8) x USB 2.0 Ports
USB 3.0	(2) x USB 3.0 Ports
Internal I/O	
USB 2.0	• Front Panel USB Header (2 ports) • Media Card Reader Header • Internal USB connector
USB 3.0	Front Panel USB 3.0 edge connector (2 ports)
PS/2	(1) x 2-port PS/2 Header, ports optional via bracket
Audio	(1) x Front Panel Mic & Line-Out Header
COM2	None
Clear CMOS	3-Pin Clear CMOS Header
Speaker	2-Pin Internal Speaker Header

Chassis Intrusion	2-Pin Chassis Intrusion Switch Header
Thermal	
Fans Headers	(1) x 4-Wire CPU Fan (1) x 4-Wire Rear Fan (1) x 3-Wire Front PCI Fan (1) x 4-Wire Front HDD Fan (1) x 5-Wire Memory Fan (1) x 3-Wire PCH Fan (PCH Fan not installed)
Power Connectors	
Main	(1) 24-Pin (2×12) ATX Standard
VRM	(1) 8-Pin (2×4) ATX 12V Standard
Graphics	(1) 4-Pin (2×2) ATX 12V Standard
Security	
TPM	Version 1.2, Nuvoton NPCT421LA0WX (Base MTMs) Version 1.2, ST Micro ST33TPM12LPC (IVB MTMs and later)
Asset ID	NXP PCA24S08
vPro	AMT 8.0
BIOS	
Vendor	AMI

Ethernet
The S30 motherboard implements onboard gigabit Ethernet via one Intel Lewisville – 82579 controller. This integrated solution has support for the industry standard functions of Wake on LAN (WOL) and Preboot Execution Environment (PXE). Jumbo Frames are supported. Additionally, for Manageability features, Lewisville will support AMT.

LPC Super IO
Nuvoton 6681D Super I/O chip.

Audio
The ALC662-VD chip from Realtek provides S30 with stereo audio capability that meets Windows7 Premium performance requirements. HD 5.1 audio is supported via jack remapping. There are 2 front analog jacks, and 3 rear color-coded (per MS Vista Logo Specification SYSFUND-0041) analog jacks.

Clock Generator
The clock generator chip on S30 is an ICS932SQ420B.

Chassis Summary
S30 Chassis is a 31-liter ATX-form factor tower mechanical with 2 external 5.25″ drive bays, 1 external 3.5″ drive bay, and 3 internal 3.5″ drive bays.

Chassis Info:
Chassis Format: Tower
Chassis color: Raven Black:
Chassis Dimension – cm: 483mm D x 175mm W x 478mm H
Chassis Dimension – in: 19.02″ D x 6.89″ W x 18.82″ H
Chassis Weight: 38.5 lbs (17.5kg) maximum configuration
Power supply: 610W 90% Efficient

1P Thermal Solution
The S30 1P system will utilize a single fansink solution supporting up to 135W CPUs. In addition to the CPU fansink, the S30 1P system will contain a rear system fan, an optional front PCI fan (to be used only with auxiliary powered graphics adapters), and an optional memory chiller (dual fan, one for each bank, only used in select memory configurations). Provisions for additional fans exist on the motherboard, but are not needed at this time.

Security & Serviceability

Physical Security and Serviceability

Access Panel	Tool-less side cover removal
Optical Drive	Tool-less

Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Color coded User Touch Points	Yes
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Tool-less
Green Color Power LED on Front of Computer	Yes
Restore CD/DVD Set	Restore system to original factory shipping image - Can be obtained via Lenovo Support
Cable Lock Support	Yes, Optional Kensington Cable Lock
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes
Power-On Password	Yes
Setup Password	Yes
NIC LEDs (integrated)	Yes
Security Chip	Yes
Access Panel Key Lock	Yes
Boot Sequence Control	Yes
Padlock Support	Yes, loop in rear for optional padlock, prevents side panel removal
Boot without keyboard and/or mouse	Yes

OPERATING ENVIRONMENT

Temperature

- Operating
  - 10 – 35 degrees C
- Non-Operating
  - -10 – 60 degrees C

Humidity

- Relative Humidity
  - Operating: 10 – 80% non-condensing (10% per hour)
  - Storage: 10 – 90% non-condensing (10% per hour)
  - Transit: 10 – 90% non-condensing (10% per hour)
- Wet Bulb Temperature
  - Operating: 25 degrees C (max)
  - Non-Operating: 40 degrees C (max)

Altitude

- Supported Altitude* (unpressurized): 0-10000ft (0-3048m)

*Operating temperature derated 1°C per 300m (1000ft) to 3000m (10000ft) above sea level.

Regulations and Standards

EMC

FCC (DoC)/Canada
CE (EMC)
VCCI
JEIDA
C-Tick
BSMI
CCIB

Safety

UL (C-UL)
TUV-GS
ISO-9241 – parts 3, 7, 8
NOM
IRAM
CCIB
PSB
CE (LVD)

Energy Star

All S30 systems are designed to with the premise of maximizing energy efficiency. The latest version of the Energy Star standard is still being defined. Pending ratification of the newest Energy Star spec, the Development team will assess which models will be able to be Energy Star compliant.

EPEAT™

S30 models which are Energy Star compliant (pending ratification of latest Energy Star spec) will also qualify for the EPEAT™ Silver rating. The Development team is currently assessing whether some or all of these models may also qualify for EPEAT™ Gold.

EuP Lot-6 2012

S30 systems are complaint with the EuP Lot-6 2012 standard for low power consumption. This is enabled by default for all systems shipping to EMEA, and can be toggled on or off in the system BIOS.

SECTION II: SUPPORTED COMPONENTS

CPU Specifications

Part Description
2S Processor SKUs – These SKUs have 2 QPI links and are targeted for dual CPU systems, but will also work on single CPU systems
Intel Xeon E5-2697 v2 – 12 cores, 2.7 GHz, 8.0 QPI, 30MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2695 v2 – 12 cores, 2.4 GHz, 8.0 QPI, 30MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2690 v2 – 10 cores, 3.0 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2680 v2 – 10 cores, 2.8 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2670 v2 – 10 cores, 2.5 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2667 v2 – 8 cores, 3.3 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2660 v2 – 10 cores, 2.2 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 95W
Intel Xeon E5-2650 v2 – 8 cores, 2.6 GHz, 8.0 QPI, 20MB Cache, DDR3-1866, Turbo, HT, 95W
Intel Xeon E5-2643 v2 – 6 cores, 3.5 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2640 v2 – 8 cores, 2.0 GHz, 7.2 QPI, 20MB Cache, DDR3-1600, Turbo, HT, 95W
Intel Xeon E5-2637 v2 – 4 cores, 3.5 GHz, 8.0 QPI, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2630 v2 – 6 cores, 2.6 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 80W
Intel Xeon E5-2620 v2 – 6 cores, 2.1 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 80W
Intel Xeon E5-2609 v2 – 4 cores, 2.5 GHz, 6.4 QPI, 10MB Cache, DDR3-1333, 80W
Intel Xeon E5-2603 v2 – 4 cores, 1.8 GHz, 6.4 QPI, 10MB Cache, DDR3-1333, 80W
2S Low Power Processor SKUs – These SKUs have 2 QPI links and are targeted for dual CPU systems, but will also work on single CPU systems. They also have a lower TDP than standard power CPUs.

Intel Xeon E5-2650L v2 - 10 cores, 1.7 GHz, 8.0 QPI, 25MB Cache, DDR3-1600, Turbo, HT, 70W
Intel Xeon E5-2630L v2 - 6 cores, 2.4 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 60W
1S Processor SKUs - These SKUs have 1 QPI link and are targeted for single CPU configurations
Intel Xeon E5-1660 v2 - 6 cores, 3.7 GHz, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1650 v2 - 6 cores, 3.5 GHz, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1620 v2 - 4 cores, 3.7 GHz, 10MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1607 v2 - 4 cores, 3.0 GHz, 10MB Cache, DDR3-1600, 130W

When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families.

Multi core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies.

64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations

RAM Specifications

Part Description
UDIMMs - 1600MHz
2GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 1Rx8 2Gbit
4GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 2Gbit
8GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 4Gbit
RDIMMs - 1600MHz
2GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 1Rx8 2Gbit
4GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx8 2Gbit
8GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx4 2Gbit
16GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx4 4Gbit
32GB DDR3 ECC RDIMM PC3-12800R (1333MHz) 2Rx4 4Gbit (performance is configuration dependant)

Memory Support Matrix

Number of DIMMs	Processor 1							
	Ch 1		Ch 2		Ch 3		Ch 4	
	DIMM 5	DIMM 1	DIMM 6	DIMM 2	DIMM 7	DIMM 3	DIMM 8	DIMM 4
1		x						
2		x		x				
3		x		x		x		
4		x		x		x		x
5	x	x		x		x		x
6	x	x	x	x		x		x
7	x	x	x	x	x	x		x
8	x	x	x	x	x	x	x	x

Storage - Hard Drive / SSD Specification

Part Description
3.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 7200rpm, 6Gb/s, 3.5″
500GB SATA - 7200rpm, 6Gb/s, 3.5″
1TB SATA - 7200rpm, 6Gb/s, 3.5″
2TB SATA - 7200rpm, 6Gb/s, 3.5″
3TB SATA - 7200rpm, 6Gb/s, 3.5″
4TB SATA - 7200rpm, 6Gb/s, 3.5″
2.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 10000rpm, 6Gb/s, 2.5″
500GB SATA - 10000rpm, 6Gb/s, 2.5″
1TB SATA - 10000rpm, 6Gb/s, 2.5″
3.5″ SAS Hard Disk Drive (HDD)
300GB SAS - 15000rpm, 6Gb/s, 3.5″
2.5″ SAS Hard Disk Drive (HDD)
146GB SAS - 15000rpm, 6Gb/s, 2.5″
300GB SAS - 15000rpm, 6Gb/s, 2.5″
2.5″ SATA Solid State Drive (SSD)
128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5″
3.5” Hybrid Drives
1TB - 7200 rpm 8GB Flash
2TB - 7200 rpm 8GB Flash
256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, OPAL, 2.5″

HDD to ODD Conversion

Kits are available through the special bid process to convert a 5.25″ HDD bay into either a 3.5″ or 2.5″ optical drive.

RAID

Supported RAID levels for a system will vary from the stated capabilities of the RAID controller due to dependencies on the number and capacity of physical disks in the system and on customer requirements for performance, fault tolerance, or data redundancy.

RAID levels and requirements:

- RAID 0 (striping) provides increased performance by writing data across multiple drives.
- RAID 1 (mirroring) provides fault tolerance by writing the data on two drives.
- RAID 5 (striping with parity) uses distributed parity data to provide fault tolerance more efficiently than RAID 1. Requires three or more drives.
- RAID 10 (or RAID 1+0) combines
- RAID 1 and RAID 0 to create a stripe of mirrors that is fault tolerant while offering increased performance. Requires four drives.
- RAID 10 (or RAID 1+0) combines RAID 1 and RAID 0 to create a stripe of mirrors that is fault tolerant while offering increased performance. Requires four drives.

Optional Hard Disk Drive Controllers:

LSI 9240-8i SATA/SAS RAID adapter
Description: PCIe x8 adapter card
Enables: Up to 8 SAS or SATA drives @ SATA3 (6GB/s) speeds, RAID 0,1 (RAID 5 supported with key)

SAS HDD enablement module (1-3 drives)
Description: S30 / C30 SAS HDD enablement module
Enables: Up to 3 SATA or SAS drives at SATA2 (3Gb/s) speeds, RAID 0,1

Storage – Optical Drive/Removable Media

Part Description
DVD-ROM Drive – 16x/48x (SATA)
DVD Burner/CD-RW Rambo Drive (SATA)
Blu-Ray Burner Drive w/AACS encryption (SATA)
25-in-1 Media Card Reader, 3.5" (with GPIO detect, longer cable)

Keyboard Specifications

Part Description
Preferred Pro Fullsize Keyboard (USB)

Pointing Devices Specifications

Part Description
Optical Wheel Mouse (800 DPI), USB – red wheel

Graphics Cards

Part Description
NVIDIA NVS300 (with DMS-59 to Dual DVI single link dongle) – 512MB GDDR3
NVIDIA NVS300 (with DMS-59 to Dual Display Port dongle) – 512MB GDDR3
NVIDIA NVS310 (Dual DP) 512MB DDR3
NVIDIA NVS315 (DMS-59) 1GB DDR3
NVIDIA NVS 510 (mini DP x 4) – 2GB DDR3
NVIDIA Quadro 410 (Dual link DVI, DP) – 512MB GDDR3
NVIDIA Quadro K600 (Dual link DVI, DP) – 1GB DDR3
NVIDIA Quadro K2000 (Dual link DVI, DP, DP) – 2GB GDDR5
NVIDIA Quadro K2000D (Dual link DVI x 2) – 2GB GDDR5
NVIDIA Quadro K4000 (Dual link DVI, DP, DP, Stereo 3D) – 3GB GDDR5
NVIDIA Quadro K5000 (Dual link DVI x 2, DP, DP) – 4GB GDDR5
SLI Implementations
2 x NVIDIA Quadro K5000 with SLI Cable
Compute Adapters
NVIDIA Tesla K20 – 5GB GDDR5 (not supported with SAS drives)

Network/Audio Devices

Part Description
IEEE 1394a (Firewire-400) PCI Express x1 Adapter (2 external ports)
Intel 82574L Gigabit CT2 Desktop Ethernet Adapter
Intel 1 Gigabit ET Dual Port Server Adapter
USB 3.0 PCI Express x1 Adapter
SoundBlaster Recon3D Audio Card (PCIe x1)

Speakers Specifications

Part Description
Lenovo Branded 2-Piece Speaker Set

Speaker Brick

SECTION III: SYSTEM TECHNICAL SPECIFICATIONS

Power Supply Specifications

Power Supply	610w PSU
Operating Voltage Range	90-264 VAC
Rated Voltage Range	100-127V 200-240V
Rated Line Frequency	50/60Hz.
Operating Line Frequency Range	47Hz/63Hz
Rated Input Current	9A @ 100-127 VAC 4.5A @ 200-240 VAC
Power Supply Fan	120x25mm, 2800rpm max
ENERGY STAR® qualified (Config Dependent)	YES
80 PLUS Compliant	YES, 80 PLUS Gold
Built-in Self Test (BIST) LED	YES
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	YES

Click here to access the ThinkStation Power Calculator.

BIOS Specifications

Features	
WMI Support	Compliant with Microsoft WBEM and the DMTF Common Information Model
ROM-Based Setup Utility (F1)	System Configuration Setup program available at power-on with F1 key
Bootblock Recovery	Recovers system BIOS when Flash ROM corrupted.
Replicated Setup	Saves System Configuration settings to file that can then be used replicated to other systems.
Boot Control	Boot control available through ROM-Based Setup Utility or with F12 key at power-on
Memory Change Alert	Power-on Error message in event of decrease in system memory
Thermal Alert	Power-on Error message in event of fan failure
Asset Tag	Support ability to set SMBIOS Type 2 Baseboard Asset Tag field.
System/Emergency ROM Flash Recovery with Video	Support process to recover system BIOS when Flash ROM corrupted
Remote Wakeup/Remote Shutdown	System admin can power on/off a client computer from remote location to provide maintenance
Quick Resume time	Support lor power S3 (suspend to RAM) and prompt resume times
ROM revision level	System UEFI (BIOS) version reported in SMBIOS Type 0 structure and in BIOS Setup
Keyboard-less Operation	System can be booted without a keyboard
Per-port Control	Allows I/O ports to be individually enabled/disabled through ROM-based setup or WMI interface
Adaptive Cooling	Fans dynamically controlled by system BIOS based on temperature. User has ability to provide custom fan control table
Security	User and Administrator passwords can protect boot and ROM-base Setup. Chassis intrusion detection protect
Intel(R) AMT (includes ASF 2.0)	Allows system to be supported from a remote location

Intel(R) TXT	Intel(R) Trusted Execution Technology provides a security foundation to build protections against software base attacks.
Memory modes	Supports mirroring, lock step, and sparing memory modes
Windows 8 ready	Supports Windows 8 requirements – Secure flash, UEFI v 2.3.1 spec

Industry Standard Specification Support

UEFI	Unified Extensible Firmware Interface v2.3.1
ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v4.0
ASF 2.0	DMTF Alert Standard Format Specification v2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6)
CD Boot	"El Torito" Bootable CD-Rom Format Specification, Version 1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus v3.0 PC Firmware Specification 2.1
PCI Express	PCI Express Base Specification 3.0
SATA	Serial ATA Revision 3.0 Specification
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Universal Serial Bus v2.0 Universal Serial Bus v3.0
SMBIOS	DMTF System Management Spec v2.7.1

Social and Environmental Responsibility

Quality Control

The company is a member of an eco declaration system that enforces regular independent quality control

Hazardous substances and preparation

Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenyl ethers (PBDE). (See legal reference and Note B1
Products do not contain Asbestos
Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorcarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide
Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation
Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP
Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm²/week
REACH Article 33 information about substances in articles is available at: http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment

Batteries

If the product contains a battery or an accumulator, it is labeled with the disposal symbol and if it contains more than 0.0005% of mercury (for button cells only) by weight, or more than 0.004% of lead, it shall be marked with the chemical symbol for the metal concerned, Hg or Pb. Information on proper disposal is provided in user manual
Button cells used in the product do not contain more than 2% by weight of mercury. Other batteries or accumulators do not contain more than 0.0005% of mercury or 0.002% of cadmium
Batteries and accumulators are easily removable by either users or service providers (as dependent on the design of the product). Exception: Batteries that are permanently installed for safety, performance, medical or data integrity reasons do not have to be "easily removable

Safety, EMC connection to the telephone network and labeling

The product complies with legally required safety standards as specified
The product complies with legally required standards for electromagnetic compatibility
If product is intended for connection to a public telecom network or contains a radio transmitter, it complies with legally required standards for radio and telecommunication devices
The product is labeled to show conformance with applicable legal requirements

Product packaging

Packaging and packaging components do not contain more than 0.01% lead, mercury, cadmium and hexavalent chromium by weight of these together.
Plastic packaging material is marked according to ISO 11469 referring ISO 1043
The product packaging material is free from ozone depleting substances as specified in the Montreal Protocol

For more information on Lenovo social environmental practices visit:
http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment

Manageability

Industry Standard Specifications	This product meets the following industry standard specifications for manageability functionality: • Intel LAN with AMT
Remote Manageability Software Solutions	Lenovo ThinkStation is supported on the following remote manageability software consoles: • Lenovo ThinkManagement Console • LANDesk Management Suite for ThinkVantage Technologies (www.landesk.com/lenovo) • Microsoft System Center Configuration Manager
System Software Manager	Lenovo ThinkStation supports software management tools from the ThinkVantage System Update suite: • System Update • Update Retriever • Thin Installer
Service, Support, and Warranty	On-site Warranty and Service: Three-years, limited warranty and service offering delivers on-site, next business-day service for parts and labor and includes free telephone support 8am – 5pm. Global coverage ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.

Go to www.lenovo.com/support and www.lenovo.com/warranty for more details

SECTION IV: TECHNICAL SPECIFICATIONS

HDD Specifications

2.5″ SAS Hard Disk Drive (HDD)
146GB SAS – 15000rpm, 6Gb/s, 2.5″
300GB SAS – 15000rpm, 6Gb/s, 2.5″
3.5″ SAS Hard Disk Drive (HDD)
300GB SAS – 15000rpm, 6Gb/s, 3.5″

Specification		2.5″ 15K
Interface		
	Connector	SAS SFF-8482
	Transfer Rate (Gb/sec)	
Performance		
	Spindle Speed(RPM)	15,000 +/-
	Power off to Spindle Stop(sec)	30 max

	DC Power to Drive Ready(sec)	30 max
	Receipt of Start Unit Command to Drive Ready(sec)	30 max
	Average Latency(msec)	2 +/- 0.25
	Full Stroke Seek for Read/Write(ms max)	
Power Management		
	Input(VDC)	+5v +- 5%
		+12v +- 5%
	Typical(Watts)	
	Idle(Watts)	
Dimensions		
	Height(mm - Max)	15
	Width(mm)	69.85 +/- 0.25
	Depth(mm - Max)	100 +/- 0.45
	Weight(grams)	
Temperature		
	Operating(C) Ambient	5 to 55
	Operating(C) Base Casting	60 max
	Non-Operating(C) Ambient	-40 to 70
	Gradient(C per Hour)	20 max
Shock		
	Operating(Gs @ 2ms)	60 max
	Non-Operating(Gs @ 2ms)	250 max

3.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 7200rpm, 6Gb/s, 3.5″
500GB SATA - 7200rpm, 6Gb/s, 3.5″
1TB SATA - 7200rpm, 6Gb/s, 3.5″
2TB SATA - 7200rpm, 6Gb/s, 3.5″
3TB SATA - 7200rpm, 6Gb/s, 3.5″
4TB SATA - 7200rpm, 6Gb/s, 3.5″
2.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 10000rpm, 6Gb/s, 2.5″
500GB SATA - 10000rpm, 6Gb/s, 2.5″
1TB SATA - 10000rpm, 6Gb/s, 2.5″
2.5″ SATA Solid State Drive (SSD)
128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5″
256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, OPAL, 2.5″

Specifications

Interface		
	Connector	SATA
	Ports	Single

	Transfer Rate	6Gb
Temperature		
Operational	Ambient (C)	0 to 55
	Base Casting (C)	60 max
	Gradient(C per Hour)	20 max
Non-Operational	Ambient(C))	-40 to 70
	Gradient(C per Hour)	30 max
Humidity		
Operational	Relative Non-Condensing Wet bulb (%)	5 to 90
	Gradient (% per hour)	20
Non-Operational	Relative Non-Condensing Wet bulb (%)	5 to 95
	Gradient (% per hour)	20
Altitude		
	Operating(feet)	-1000 to 10,000
	Non-Operating(feet)	-1000 to 40,000
Shock - All Axis		
Operational No Data loss. Data recovery is allowed	½ Sine @ 2ms (Read & Write) (G)	60
	Rotational (Rad/sec**2)	8.5
Non-Operational No damage allowed	½ Sine @ 2ms (G)	250
	Rotational (Rad/sec**2)	20,000

HDD Controller

LSI 9240-8i SATA/SAS RAID adapter

PCI Bus	PCI-Express 2.0 x8 lanes
PCI Modes	Bus Master DMA
RAID Levels	RAID 0, 1, 5, 10, 50 and JBOD mod
Data Transfer Rates	Up to 6 Gb/s per port
PCI Card Type	3.3V Add-in card
PCI Voltage	+12V ±10
PCI Power	13.5W
Bracket	Full Height and Low-Profile
Certification Level	PCI-Express 2.0
Internal Connectors	Two X4 Mini-SAS SFF8087 (vertical orientation

Optical Drives Specifications

CD - RW Rambo Drive

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA/ATAPI
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R

	DVD-RW CD-R CD-RW

Disc Capacity

DVD-ROM	8.5 GB DL or 4.7 GB standard
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)

Maximum Data Transfer Rates

CD ROM Read	CD-ROM, CD-R Up to 40X CD-RW Up to 32X
DVD ROM Read	DVD-RAM Up to 12X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 16X DVD-ROM DL Up to 8X DVD+R Up to 16X DVD-R Up to 16X

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC – <1000 mA typical, <1600 mA maximum 12 VDC – <600 mA typical, <1400 mA Maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	10% to 90%
Maximum Wet Bulb Temperature	30° C (86° F)

Operating Systems Supported
Windows 7 Professional 32-bit and 64-bit,
Windows XP Professional or Windows XP Home 32*.
Red Hat Enterprise Linux(RHEL) 6
Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.

Kit Contents
SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

DVD – ROM Drive

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA/ATAPI
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Capacity DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB

Access Times

DVD-ROM Single Layer	< 140 ms (typical)
CD-ROM Mode 1	< 125 ms (typical)
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC – <1000 mA typical, < 1600 mA maximum 12 VDC – < 600 mA typical, < 1400 mA maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	10% to 90%
Maximum Wet Bulb Temperature	30° C (86° F)

Operating Systems Supported
Windows 7 Professional 32-bit and 64-bit,
Windows XP Professional or Windows XP Home 32*.
Red Hat Enterprise Linux(RHEL) WS4**, 5, 6
Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.

Blu-Ray Burner Drive w/ AACS encryption

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Formats	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW

Disc Capacity

DVD-ROM	8.5 GB DL or 4.7 GB standard
Blu-ray	50 GB DL or 25 GB standard
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)
Blu-ray	<275 ms (seek)
Startup Time	BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S

	DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45S CD-ROM 45S
Maximum Data Transfer Rates CD ROM Read	CD-ROM CD-R CD-RW Up to 40X Up to 40X Up to 40X
DVD ROM Read	DVD-RAM Up to 5X DVD+RW Up to 10X DVD-RW Up to 10X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 16X DVD-ROM DL Up to 8X DVD+R Up to 12X DVD-R Up to 12X
Blu-Ray	BD-ROM Up to 6X BD-ROM DL Up to 4.8X BD-R Up to 6X BD-R DL Up to 4.8X BD-R Up to 6X BD-RE SL/DL Up to 4.8X

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p
DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	15% to 80%
Maximum Wet Bulb Temperature	30° C (86° F)

Operating Systems Supported
Windows 7 Professional 32-bit and 64-bit,
Windows XP, Professional or Windows XP Home 32*.
Red Hat Enterprise Linux(RHEL) WS 6

Kit Contents
Blue Laser RW Drive, Roxio Easy Media
Creator software, Intervideo WinDVD
Software, installation guide.

Disclaimer
As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

29-in-1 Media Card Reader

Description
The Media Card Reader device uses the same physical form factor and mounting as a Floppy Disk Drive. The device connects to a 2×5 two channel USB header on the motherboard of the system. There is no USB controller card provided. Please see the Disc Formats section below for a list of flash memory card formats that are supported. Mounting Orientation The Media Card Reader can be mounted in a dedicated Floppy Drive bay (if the chassis provides one) or in an appropriate Optical Bay adapter. It will operate in any orientation.

Interface Type

USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)

Disc Formats
xD-H
xD-M
Micro SD
Micro SDHC
SD
SDHC
SDXC
Mini SD
Mini SDHC
MultiMediaCard (MMC)
Reduced Size MultiMediaCard (RS MMC)
(MMC Plus)
(MMC Mobile)
CompactFlash Card Type I (CF Type 1)
CF Type 2
MicroDrive (MD)
Memory Stick (MS)
Memory Stick Select
MS Duo
MS PRO
MS PRO DuMS PRO-HG Duo
MS XS Duo
MS XC-HG Duo
MS HG Micro*
MS XC Micro*
MS XC-HG Micro*

MMC Micro
Memory Stick Micro (M2)*
*Available with adapter

Video Cards

NVIDIA NVS 300 512MB Graphics Card

Form Factor
2.7 inches (H) x 5.7 inches (L), Half-Height

Graphics Controller
NVIDIA NVS 300 Graphics Board

Bus Type
PCI Express x16, Generation 2.0

Memory
512 MB GDDR3 SDRAM unified graphics memory

Connectors
DMS-59
Includes DMS-59 to Dual DVI-I adapter or DMS-59 to Dual DP adapter

Maximum Resolution
DVI: two digital displays up to 1920 x 1200
DisplayPort: two digital displays up to 2560 x 1600
VGA: two analog displays up to 1920 x 1080

Image Quality Features

Display Output
This card support up to two displays: Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking (through optional DMS-59 to DisplayPort adapter)

Drives VGA enabled analog displays at resolutions up to 1920 x 1080 (through optional DMS-59 to VGA adapter)

Supported Graphics APIs
OGL 3.3
DirectX 10.1

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

Power Consumption
<18 Watts

NVIDIA NVS 310 512MB Graphics Card

Form Factor
Low Profile: 2.713 inches in height × 6.150 inches in length

Graphics Controller
NVIDIA NVS 310

Bus Type
PCI Express x16, 2.0 compliant

Memory
Size: 512MB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s
Connectors
2 x DisplayPort 1.2

Maximum Resolution
Up to 2560 x 1600 (digital display) per display.

Image Quality Features
See Display Output section.
The following video formats are supported:
- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 and later
- MVC

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

Display Output
Up to 2 displays in the following configurations:

Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.

DVI-D output:

Drives two digital display at resolutions up to 1920 × 1200 at 60Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output:
NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors

VGA display output:
Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
DX11, OpenGL 4.1

Available Graphics Drivers

Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL)

Power Consumption
19.5 Watts

Note

The thermal solution used on this card is an active fan heatsink.

NVIDIA Quadro NVS 315

1GB PCIe Graphics Card
Form Factor
Low Pofile, 1/2 length Active cooling
Bus Type
PCI Express x16, Generation 2.0
Memory
1GB GDDR3
Connectors
DMS59
Maximum Resolution
DisplayPort: 2560 x 1600
DVI: 1920 x 1200
VGA: 2048 x 1536
Supported Graphics APIs
OpenGL 4.1 DirectX 11
Available Graphics Drivers
Microsoft Windows 8 (64-bit and 32-bit)
Microsoft Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

NVIDIA Quadro NVS 510

CUDA Cores
192

Memory Size Total
2.0 GB DDR3

Memory Interface
128-bit

Memory Bandwidth (GB/sec)
28.5

Display Connector
Mini DisplayPort (mDP)

# of Connectors
4

DisplayPort
4

Single-Link DVI-D
4[1]

Dual-Link DVI-D
4[2]

VGA
4[3]

Maximum Display Resolution (Digital @ 60Hz)
3840×2160[4]

Maximum Display Resolution (Analog @ 60 Hz)
1920×1200[5]

Number of Slots
1

Audio Support (via DisplayPort)
✓

1 using mDP to SL-DVI, or included mDP-DP Cable with a DP to SL-DVI Cable Adaptor
2 using included mDP-DP cable with DP to DL-DVI Cable Adaptor
3 using included mDP-DP cable with DP to VGA Cable Adaptor
4 Through native DisplayPort (DP)
5 Through DP to VGA Cable Adaptor

NVIDIA Quadro 410 512MB Graphics

Form Factor
Low Profile: 2.713 inches × 5.7 inches, single slot
Graphics Controller
NVIDIA Quadro 410

Bus Type
PCI Express x16, 3.0 compliant

Memory
Size: 512MB DDR3
Clock: 900MHz
Memory Bandwidth: 14GB/s

Connectors
One dual-link DVI-I connector
One DisplayPort connector

Maximum Resolution
Up to 2560 x 1600 (digital display) per display.

RAMDAC
400 MHz integrated RAMDAC

Display Output
Maximum resolution over DisplayPort: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)
Maximum resolution over DVI port: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)
Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
DX11, OpenGL 4.2

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

Power Consumption
< 35 Watts

QUADRO K600

CUDA Parallel-Processing Cores
192

Frame Buffer Memory
1 GB DDR3

Max Power Consumption
41W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (1)

Form Factor
2.713" H x 6.3 L Single Slot

QUADRO K2000

CUDA Parallel-Processing Cores
384

Frame Buffer Memory
2 GB GDDR5

Max Power Consumption
51W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (1)

Form Factor
4.376" H x 7.97 L Single Slot

QUADRO K4000

CUDA Parallel-Processing Cores
768

Frame Buffer Memory
3 GB GDDR5

Max Power Consumption
80W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (2)

Form Factor
4.376" H x 9.5 L Single Slot

NVIDIA Quadro 2000D (Spec DVI only card)

Form Factor
4.376" H x 7" L
Single Slot

Graphics Controller
NVIDIA Quadro 2000D Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
1 GB GDDR5
128-bit

Connectors
2 Dual Link DVI outputs

Maximum Resolution
Dual-link DVI output (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)

Image Quality
Features Up to 16K x16K texture and render processing
Transparent multisampling and super sampling

16x angle independent anisotropic filtering
128-bit floating point performance
32-bit per-component floating point texture filtering and blending
Support for any combination of two connected displays
Dual Link DVI, HDMI 1.3a, and HDCP support
NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support
Full OpenGL quad buffered stereo support
Underscan/overscan compensation and hardware scaling
NVIDIA® nView® multi-display technology

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
OpenGL 4.0
DirectX 11
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

Power Consumption
62 Watts

NVIDIA Quadro 4000 2GB Graphics Card

Form Factor
4.376″ H x 9.50″ L
Single Slot

Graphics Controller
NVIDIA Quadro 4000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
2 GB GDDR5
256-bit

Connectors
1 DVI-I output, 2 DisplayPort outputs;
Stereo bracket included

Maximum Resolution
Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)
Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)

RAMDAC
400 MHz integrated RAMDAC

Image Quality Features
Up to 16K x16K texture and render processing
Transparent multisampling and super sampling
16x angle independent anisotropic filtering
128-bit floating point performance
32-bit per-component floating point texture filtering and blending
Support for any combination of two connected displays
DisplayPort 1.1a, HDMI 1.3a, and HDCP support
NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other
3D stereo format support
Full OpenGL quad buffered stereo support
Underscan/overscan compensation and hardware scaling
NVIDIA nView® multi-display technology

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
OpenGL 4.0
DirectX 11

CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available GraphicsDrivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation

Power Consumption
142 Watts

NVIDIA Quadro 5000 2.5GB Graphics Card

Form Factor
4.376″ H x 9.75″ L
Dual Slot

Graphics Controller
NVIDIA Quadro 5000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
2.5 GB GDDR5 320-bit

Connectors
DVI-I (1), DP (2), Stereo (1)

Maximum Resolution
Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)
Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)

Image Quality Features Up to 16K x16K texture and render processing
Transparent multisampling and super sampling
16x angle independent anisotropic filtering
128-bit floating point performance
32-bit per-component floating point texture filtering and blending
Support for any combination of two connected displays
DisplayPort 1.1a, HDMI 1.3a, and HDCP support
NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other
3D stereo format support
Full OpenGL quad buffered stereo support
Underscan/overscan compensation and hardware scaling
NVIDIA nView® multi-display technology

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
OpenGL 4.0
DirectX 11
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation

Power Consumption
152 Watts

NVIDIA Quadro K5000 4GB Graphics Card

CUDA Cores
1536

Single Precision Compute Performance
2.1 Teraflops

Memory Size Total

4GB GDDR5

Memory Interface
256-bit

Memory Bandwidth (GB/sec)
173 GB/s

Dual Link DVI-I
1

Dual Link DVI-D
1

DisplayPort 1.2
2

# of Digital Outputs
4

Stereo (3-pin Mini-DIN)
Optional

Maximum Display Resolution (Digital)
DVI-DL: Up to 330M Pixels/sec: (ex 1920×1200@120Hz, 2560×1600@60Hz)
DisplayPort 1.2: Up to 540M Pixels/sec & 17.3 Gbps data rate
(ex 3840×2160@60Hz 30bpp, 2560×1440@120Hz 30bpp, 4096×2160@24Hz 36bpp,
4096×2160@50Hz 30bpp)

NVIDIA Tesla C2075 Compute Processor

Form Factor
4.376 inches by 9.75 inches
Dual Slot

System Interface
PCI Express Gen2 ×16

Video Outputs
One Dual Link DVI-I
(Video output on this connector is not supported in Maximus configurations per NVIDIA)

Memory
6GB GDDR5

Peak Memory Bandwidth
+170 GB/s

Supported APIs
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Supported Operating Systems
Genuine Windows 7 Professional (64-bit)
Genuine Windows Vista Business (64-bit)
Microsoft Windows XP Professional (64-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit)

Processor Cores
448 CUDA cores

Power Consumption
~215 Watts

Audio Devices

SoundBlaster Recon3D Audio Card (PCIe x1)

24-bit Analog-to-Digital conversion of analog inputs	96kHz sample rate

24-bit Digital-to-Analog conversion of digital sources	96kHz to analog
16-bit to 24-bit recording sampling rates	8,11.025,16, 22.05, 24, 32, 44.1, 48 and 96kHz
16-bit to 24-bit playback sampling rates	8,11.025,16, 22.05, 24, 32, 44.1, 48, 96 and 192kHz
Rear Panel Connectivity	Line in / Microphone In: Shared 1/8″ mini jack Headphone: 1 x 1/8″ mini jack Speaker Out: 3x 1/8″ mini jacks Optical Out: TOSLINK Optical In: TOSLINK
Speaker Support	Stereo/2.1 Speakers 5.1 Speakers Headphones
Bus Connection	PCI Express 1x
Package Contents	Sound Card Quick Start leaflet Installation CD containing: • Drivers for Windows® • Creative Software Suite • User's Guide
Software	Sound Blaster Recon3D PCIe Control Panel • THX® TruStudio Pro™ effects • THX® TruStudio Pro Surround™ • THX® TruStudio Pro Crystalizer™ • THX® TruStudio Pro Bass™ • THX® TruStudio Pro Smart Volume™ • THX® TruStudio Pro Dialog Plus™ CrystalVoice effects • CrystalVoice™ Acoustic Echo Cancellation • CrystalVoice™ Noise Reduction • CrystalVoice™ Smart Volume • CrystalVoice™ FX • CrystalVoice™ Focus EAX Advanced HD OpenAL Creative Alchemy
Minimum System Requirements	Intel® Core™ 2 Duo or AMD® equivalent processor, 2.2 GHz or faster Intel®, AMD® or 100% compatible motherboard Microsoft® Windows® 7 (32/64-bit) 1 GB RAM 600 MB of free hard disk space Available PCI Express® (x1, x4 or x16) slot Available CD-ROM or DVD-ROM drive

Networking

Intel 82574L Gigabit CT2 Desktop Ethernet Adapter

Connector	RJ-45
Controller	Intel 82574L
Memory	Integrated Dual 48K configurable transit receive FIFO Buffers
Data Rates Supported	10/100/1000 Mbps
Compliance	IEEE 802.1p, Quality of Service (QoS) Support
Bus Architecture	PCI-E 1.1
Typical Power Consumption	1.9W
Operating Temperature	32° to 131° F (0° to 55° C)
Storage Humidity	90% at 35°C
Dimensions (H x W x D)	12cm x 5.53cm x 11.92cm
Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows XP Professional 64-bit, Red Hat Enterprise Linux 4 (4.8 or newer), 5 (5.3 or newer), 6

Intel 1 Gigabit ET Dual Port Server Adapter

Cabling Type	Category-5 up to 100m
Bracket Height	Low Profile & Full Height
Max TDP	2.9 W
Networking Specifications	
# of Ports	Dual
System Interface Type	PCIe v2.0 (2.5GT/s)
Intel® Virtualization Technology for Connectivity (VT-c)	VMDq, VMDc
Speed & Slot Width	2.5 GT/s, x4 Lane
Controller	Intel 82576

USB 3.0

Interface:	Single-Lane (x1) PCI Express Gen2
Mode:	Universal Serial Bus 3.0
Controller:	Renesas (NEC) µPD720200
PCB Version:	Ver1.1
Port:	2 external USB3.0 ports
Speed:	Data Transfer rate of 1.5/12/480/5000 Mbps. Low Speed (1.5Mbps), Full Speed(12Mbps), High Speed(480Mbps), Super Speed(5Gpbs)
Power Output:	+5V / 900mA (each port)
Bracket:	Standard 121mm / Low Profile 79.2mm
O.S. support:	Windows XP/2003/Vista/7/2008, (32/64-bit) Linux 2.6.31 or later (Linux OS already implemented USB3.0 driver)
Environment:	Operation temp. 0 °C ~ 57 °C
Operation humidity:	5 ~ 95% RH
Storage temp.	-20 °C ~ 85 °C

IEEE 1394a (Firewire-400) PCI Express x1 Adapter

Data Transfer Rate	Supports up to 400 Mbps
Devices Supported	IEEE-1394 compliant devices
Bus Type	PCIe card full height PCIe slots
Ports	Two IEEE-1394a bilingual 6-Pin Connector (Rear)
System Requirements	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional. Not supported on Linux. Pentium® III or higher processor 128-MB RAM 1-GB Hard Drive CD-ROM drive Built in sound system Available PCI slot
Temperature - Operating	50° to 131° F (10° to 55° C)
Temperature - Storage	-22° to 140° F (-30° to 60° C)
Relative Humidity - Operating	20% to 80%
Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit. Not supported on Linux